Review of Cranial Nerves

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CN 1- Olfactory

- Check air movement thru ea nostril separately – push gently on outside of nostril, occluding it.
  Then ask patient to inhale/exhale thru other, assuring it's unobstructed.
- Screen for problems w/sense of smell using alcohol pad.
- Ask patient to close eyes & present alcohol pad slowly up towards the nostril being tested (checking ea separately).
- Odor normally detectable @ distance of ~10cm

Functional Assessment – Acuity (CN 2 – Optic)

- Using hand held card (held @ 14 inches) or Snellen wall chart, assess each eye separately. Allow patient to wear glasses.
- Direct patient to read aloud line with smallest lettering that they're able to see.

Hand Held Acuity Card

Functional Assessment CN2 – Acuity (cont)

- 20/20 =s patient can read at 20` with same accuracy as person with normal vision.
- 20/400 =s patient can read at 20` what normal person can read from 400` (i.e. very poor acuity).
- If patient can't identify all items correctly, number missed is listed after a '-' sign (e.g. 20/80 -2, for 2 missed on 20/80 line).

Snellen Chart For Acuity Testing

Functional Assessment - Visual Fields (Cranial Nerve 2 - Optic)

Optic Tracts and Lesions - Washington University SOM

Checking Visual Fields By Confrontation – CN2

- Face patient, roughly 1-2 ft apart, noses @ same level.
- Close your R eye, while patient closes their L. Keep other eyes open & look directly at one another.
- Move your L arm out & away, keeping it ~ equidistant from the 2 of you. A raised index finger should be just outside your field of vision.

Checking Visual Fields By Confrontation CN2 (cont)

- Wiggle finger & bring it in towards your noses. You should both be able to detect it @ same time.
- Repeat, moving finger in from each direction. Use other hand to check medial field (i.e. starting in front of the closed eye).
- Then repeat for other eye.

CNs 2&3 - Pupilary Response

- Pupils modulate amount of light entering eye (like shutter on camera lens)
- Dark conditions→dilate; Bright→constrict
- Pupils respond symmetrically to input from either eye
  - Direct response =s constriction in response to direct light
  - Consensual response =s constriction in response to light shined in opposite eye
- Light impulses travel away (afferents) from pupil via CN 2 & back (efferents) to cilliary muscles that control dilatation via CN 3

CNs 2&3 - Pupilary Response Testing Technique (cont)

- Make sure room is dark→ pupils dilated, yet not so dark cant observe response – use your hand to provide “shade” over eyes
- Shine a light in R eye:
  - R pupil should constrict
  - Again shine light in R eye, though this time watch L pupil (should also constrict)
- Shine a light in L eye:
  - L pupil should constrict
  - Again shine light in L eye, though this time watch R pupil (should also constrict)

Pupil Response Simulator - UC Davis

CNs 2&3 - Describing Pupilary Response

- Normal recorded as: **PERRLA** (**P**upils **E**qual, **R**ound, **R**eactive to **L**ight and **A**ccomodation) – with accomodation = to constriction occurring when eyes follow finger brought in towards them, directly in middle (i.e. when looking “cross eyed”).
- Abnormal responses can be secondary to:
  - direct or indirect damage to either CN 2 or 3
  - meds e.g. sympathomimetics (cocaine)→ dilate; narcotics (heroin)→ constrict.

CNs 3, 4 & 6
Extra Ocular Movements

- Eye movement dependent on Cranial Nerves 3, 4, and 6 & muscles they innervate.
- Allows smooth, coordinated movement in all directions of both eyes simultaneously
- There's some overlap between actions of muscles/nerves

Anatomy - Extraoccular Muscles
(http://www.e-sunbear.com)

CNs 3, 4 & 6
Extra Ocular Movements (cont)

- CN 6 (Abducens)→ Lateral rectus muscle – moves eye laterally
- CN 4 (Trochlear)→ Superior oblique muscle - moves eye down (depression) when looking towards nose; also rotates internally.
- CN 3 (Oculomotor)→All other muscles eye movement – also raises lid & mediates pupilary constriction.

CNs 3, 4 & 6 - & Muscles That Control Extra Ocular Movements

LR- Lateral Rectus

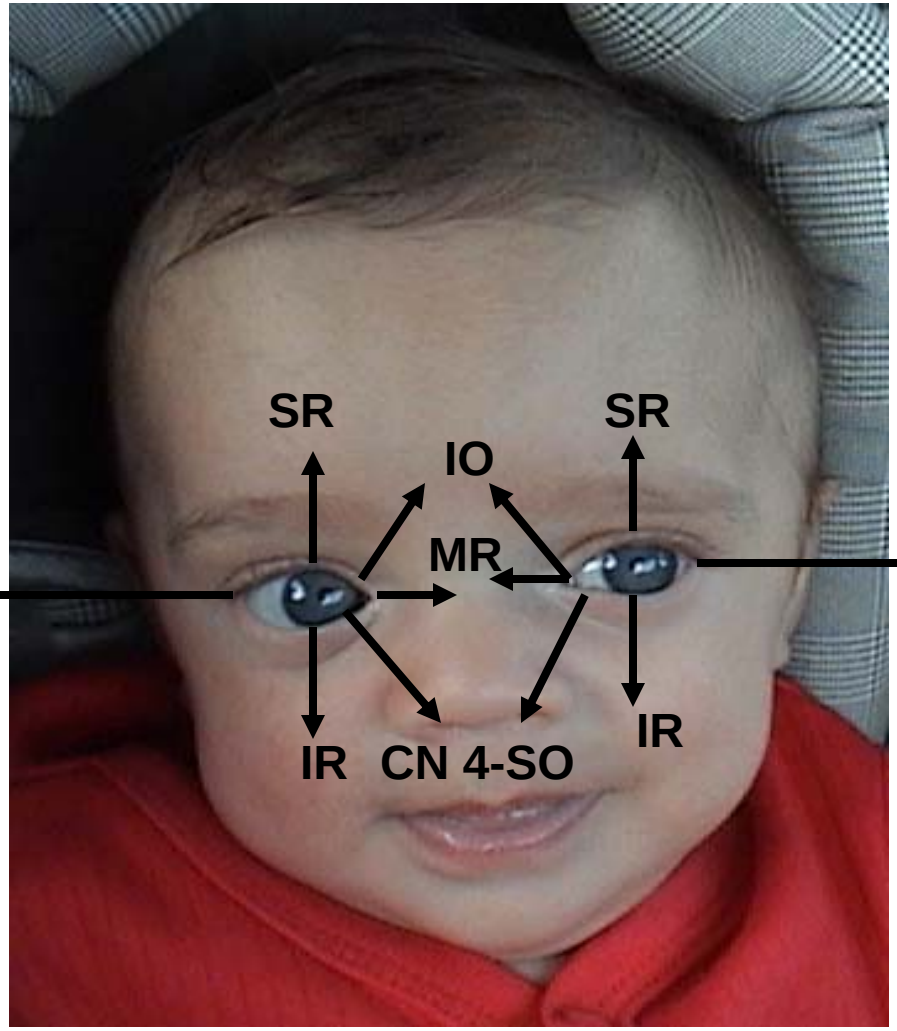
MR-Medial Rectus

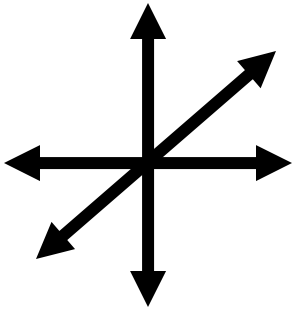
SR-Superior Rectus

IR-Inferior Rectus

SO-Superior Oblique

IO-Inferior Oblique





6 “Cardinal” Directions Movement

SO ‘4’, LR ‘6’, All The Rest ‘3’

CNs 3, 4, & 6: Techniques For Testing Extra-Ocular Movements

- To Test:
  - Patient doesn't move head, following your finger w/their eyes as you trace out letter "H"
  - Alternatively, direct them to follow finger w/their eyes as you trace large rectangle
- Eyes should move in all directions, in coordinated, symmetric fashion.

Eye Movement Simulator - UC Davis

Function CN 5 - Trigeminal

- Sensation:
  - 3 regions of face: Ophthalmic, Maxillary & Mandibular
- Motor:
  - Temporalis & Masseter muscles

Function CN 5 – Trigeminal (cont)

Motor

Temporalis (clench teeth)

Masseter (move jaw side-side)

Sensory

Ophthalmic(V1)

Maxillary (V2)

Mandibular (V3)

* Corneal Reflex: Blink when cornea touched - Sensory CN 5, Motor CN 7

Testing CN 5 - Trigeminal

- Sensory:
  - Ask pt to close eyes
  - Touch ea of 3 areas (ophthalmic, maxillary, & mandibular) lightly, noting whether patient detects stimulus.
- Motor:
  - Palpate temporalis & mandibular areas as patient clenches & grinds teeth

  Anatomy of Masseter and Temporalis Muscles
- Corneal Reflex:
  - Tease out bit of cotton from q-tip - Sensory CN 5, Motor CN 7
  - Blink when touch cornea with cotton wisp

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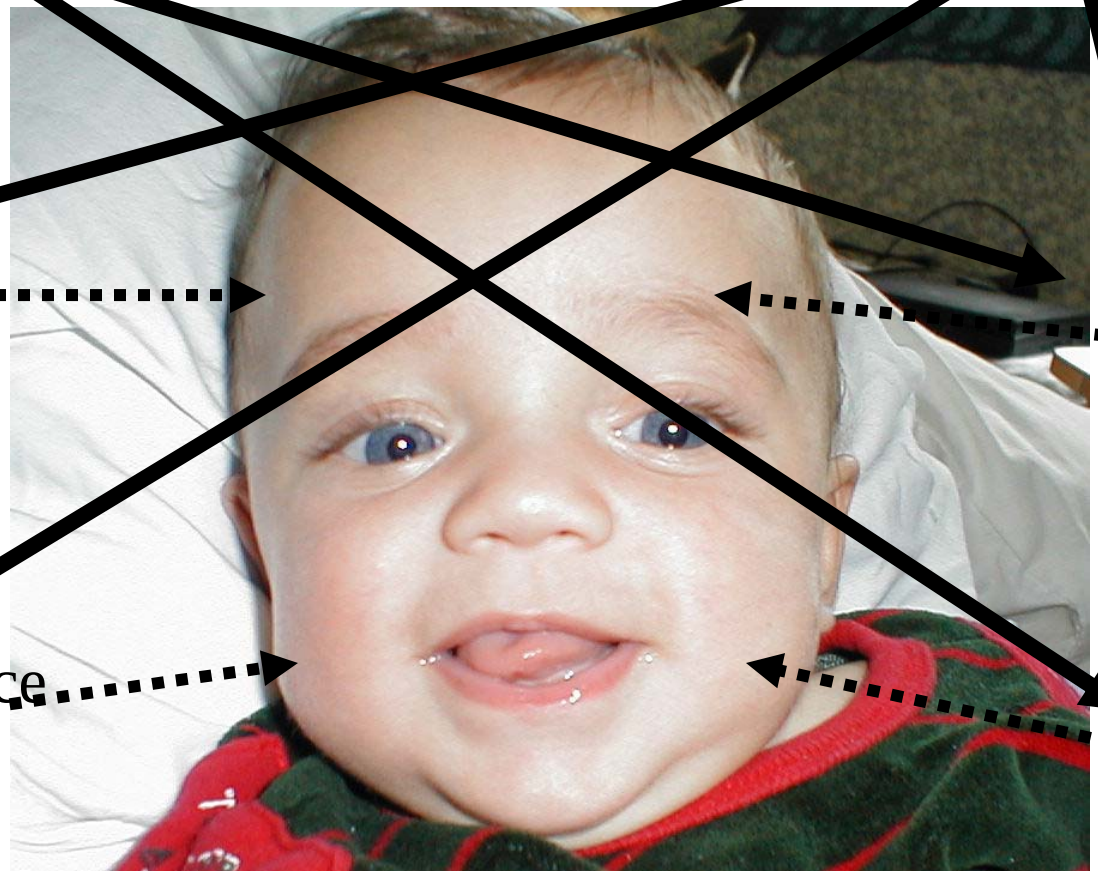
Function CN 7 – Facial Nerve
Facial Symmetry & Expression - Precise Pattern of Inervation



CN 7 – Exam

- Observe facial symmetry
- Wrinkle Forehead
- Keep eyes closed against resistance
- Smile, puff out cheeks

Cute.. and symmetric!

The Ear – Functional Anatomy and Testing (CN 8 – Acoustic)

- Crude tests hearing – rub fingers next to either ear; whisper & ask pt repeat words
- If sig hearing loss, determine Conductive (external canal up to but not including CN 8) v Sensorineural (CN 8)

Inner Ear Anatomy

(www.ncbegin.org/audiology)

Animated Ear Function: http://www.learnerstv.com/animation/animation.php?ani=313&cat=medical

CN 8 - Defining Cause of Hearing Loss - Weber Test

- 512 Hz tuning fork - this (& not 128Hz) is well w/in range normal hearing & used for testing
  - Get turning fork vibrate→ striking ends against heel of hand **or**

    Squeeze tips between thumb & 1st finger
- Place vibrating fork mid line skull
- Sound should be heard =ly R and L → bone conducts to both sides.

CN 8 - Weber Test (cont)

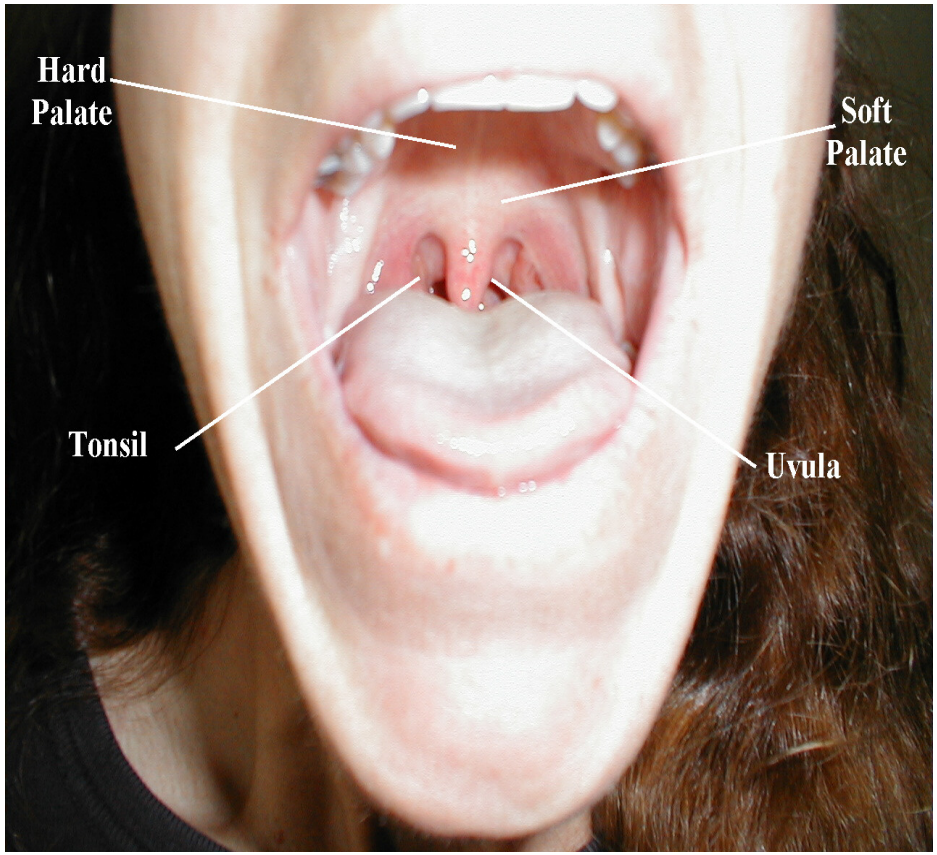
- If **conductive** hearing loss (e.g. obstructing wax in canal on L)→louder on L as less competing noise.
- If **sensorineural** on L→louder on R
- Finger in ear mimics conductive loss

CN 8 - Defining Cause of Hearing Loss - Rinne Test

- Place vibrating 512 hz tuning fork on mastoid bone (behind ear).
- Patient states when can't hear sound.
- Place tines of fork next to ear→ should hear it again – as air conducts better then bone.
- If BC better then AC, suggests **conductive** hearing loss.
- If **sensorineural** loss, then AC still > BC

Note: Weber & Rinne difficult to perform in Anatomy lab due to competing noise – repeat @ home in quiet room!

Oropharynx: Anatomy & Function CNs 9 (Glosopharyngeal), 10 (Vagus) & 12 (Hypoglossal)



- **Uvula midline - CN 9**
- Stick out tongue, say "**Ahh**" – use tongue depressor if can't see - palate/uvula rise **-CN 9, 10**
- **Gag Reflex** – provoked with tongue blade or q tip **- CN 9, 10**
- **Tongue midline** when patient sticks it out→**CN 12**
  - check **strength** by directing patient push **tip** into **inside** of **either cheek** while you push from outside

Neck Movement (CN 11 – Spinal Accessory)

- **Turn head** to **L** into R hand→ function of **R Sternocleidomastoid** (SCM)
- **Turn head** to **R** into L hand (**L SCM**)
- **Shrug shoulders** into your hands

Summary of Skills

- □ Wash Hands
- □ CN1 (Olfactory) Smell
- □ CN2 (Optic) Visual acuity; Visual fields
- □ CNs 2&3 (Optic, Occulomotor) Pupilary Response to light
- □ CNs 3, 4 & 6 (Occulomotor, Trochlear, Abduscens) Extra-Occular Movements
- □ CN 5 (Trigeminal) Facial sensation; Muscles Mastication (clench jaw, chew); Corneal reflex (w/CN 7)
- □ CN 7 (Facial) Facial expression
- □ CN 8 (Auditory) Hearing
- □ CN 9, 10 (Glosopharyngeal, Vagus) Raise palate (“ahh”), gag
- □ CN 12 (Hypoglossal) Tongue
- □ CN 11 (Spinal Accessory) Turn head against resistance, shrug shoulders

Time Target: < 15 minutes